

Appl. S.N. 10/628,966  
Amdt. dated February 12, 2007  
Reply to Office Action of November 15, 2006  
Docket No. 200209420-1

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In the claims:

1. (Currently Amended) ~~A pigment-based~~ An inkjet ink set consisting essentially of comprising

a pigment-based black ink including at least one self-dispersed black pigment, at least one cosolvent, water, optionally at least one water-soluble surfactant/amphiphile, and a polymer consisting essentially of a hydrolyzed form of styrene-maleic anhydride copolymer; and

~~at least one dye-based color ink, said black ink including at least one self-dispersed black pigment, at least one cosolvent, water, optionally at least one water-soluble surfactant/amphiphile, and a polymer, wherein said polymer consists essentially of a hydrolyzed form of styrene-maleic anhydride copolymer and wherein said at least one color ink includes~~ including a component selected from the group consisting of multivalent salts and organic acids, a water-soluble dye, at least one cosolvent, and water;

wherein said hydrolyzed styrene-maleic anhydride copolymer interacts with said multivalent salts which are incompatible therewith, or wherein said hydrolyzed styrene-maleic anhydride copolymer interacts with said organic acids by rendering said polymer in said pigment-based black ink insoluble by transforming said polymer into a water-insoluble protonated form and thereby improve black-to-color bleed,

and wherein said organic acids are selected from the group consisting of: polyacrylic, acetic, glycolic, malonic, malic, maleic, ascorbic, succinic, glutaric, fumaric, citric, tartaric, lactic, sulfonic, ortho-phosphoric acids and mixtures thereof.

2. (Currently Amended) The inkjet ink set of Claim 1 wherein said self-dispersed black pigment has a concentration in said pigment-based black ink of ranging from about 0.001 to 10 wt%.

3. (Canceled)

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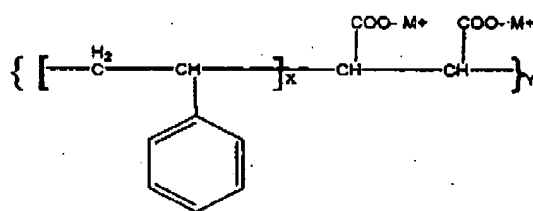
4. (Currently Amended) The inkjet ink set of Claim 1 wherein said cosolvent has a concentration in said pigment-based black ink of ranging from about 0.01 to 50 wt%.

5. (Currently Amended) The inkjet ink set of Claim 1 wherein said at least one surfactant/amphiphile has a concentration in said pigment-based black ink of up to 40 wt%.

6. (Currently Amended) The inkjet ink set of Claim 5 wherein said at least one surfactant/amphiphile has a concentration of ranging from about 0.1 to 5 wt%.

7. (Currently Amended) The inkjet ink set of Claim 1 wherein said water comprises the balance of said pigment-based black ink.

8. (Currently Amended) The inkjet ink set of Claim 1 wherein said hydrolyzed styrene-maleic anhydride copolymer has the general formula:



(I)

where counter-ion M<sup>+</sup> is selected from the group consisting of sodium, potassium, ammonium, trimethylammonium, and lithium.

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9. (Currently Amended) The inkjet ink set of Claim 8 wherein said copolymer has a molar ratio of styrene to maleic anhydride repeat units within a range of ~~[[from]]~~ 0.2 to 5.

10. (Currently Amended) The inkjet ink set of Claim 9 wherein said molar ratio is within a range of ~~[[from]]~~ 0.5 to 2.

11. (Original) The inkjet ink set of Claim 8 wherein said copolymer has a molecular weight within a range of about 500 to 50,000 (molecular weight average).

12. (Original) The inkjet ink set of Claim 11 wherein said molecular weight is within a range of about 1,000 to 10,000.

13. (Currently Amended) The inkjet ink set of Claim 1 wherein said hydrolyzed styrene-maleic anhydride copolymer has a concentration in said pigment-based black ink of ranging from about 0.1 to 10 wt%.

14. (Currently Amended) The inkjet ink set of Claim 13 wherein said hydrolyzed styrene-maleic anhydride copolymer has a concentration of ranging from about 0.1 to 3 wt%.

15. (Previously Presented) The inkjet ink set of Claim 1 wherein said multivalent salts include at least one multivalent cation.

16. (Original) The inkjet ink set of Claim 15 wherein said at least one multivalent cation is selected from the group consisting of alkaline metal earths of Group 2A of the Periodic Table, transition metals of Group 3B of the Periodic Table, cations from Group 3A of the Periodic Table, lanthanides, and mixtures thereof.

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17. (Original) The inkjet ink set of Claim 16 wherein said at least one multivalent cation is selected from the group consisting of magnesium, calcium, lanthanum, aluminum, neodymium, and mixtures thereof.

18. (Currently Amended) The inkjet ink set of Claim 15 wherein said at least one multivalent cation is present in an amount of ranging from about 1 to 10 wt% of said at least one dye-based color ink.

19. (Currently Amended) The inkjet ink set of Claim 1 wherein said at least one dye-based color ink includes at least one of said organic acids.

20. (Canceled)

21. (Canceled)

22. (Currently Amended) The inkjet ink set of Claim 1 wherein said at least one organic acid is present in an amount of ranging from about 0.25 to 20 wt% of said at least one dye-based color ink.

23. (Currently Amended) The inkjet ink set of Claim 22 wherein said at least one organic acid is present in an amount of ranging from about 1 to 5 wt% of said at least one dye-based color ink.

24. (Currently Amended) A method of controlling bleed between a black pigment-based inkjet ink and a color dye-based inkjet ink, ~~said black pigment-based ink including at least one self-dispersed black pigment~~, said method comprising:

formulating said pigment-based black ink consisting essentially of with a polymer, ~~wherein said polymer consists essentially of~~ a hydrolyzed form of

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styrene-maleic anhydride copolymer, at least one self-dispersed black pigment, at least one cosolvent, water, and optionally at least one water-soluble surfactant/amphiphile; and wherein

formulating said at least one dye-based color ink consisting essentially of includes a component selected from the group consisting of multivalent salts and organic acids, a water-soluble dye, at least one cosolvent, water, and combinations thereof, wherein said organic acids are selected from the group consisting of: polyacrylic, acetic, glycolic, malonic, malic, maleic, ascorbic, succinic, glutaric, fumaric, citric, tartaric, lactic, sulfonic, ortho-phosphoric acids and mixtures thereof; and

printing said pigment-based black ink adjacent said at least one dye-based color ink whereby wherein said hydrolyzed styrene-maleic anhydride copolymer interacts with said multivalent salts which are incompatible therewith, or wherein said hydrolyzed styrene-maleic anhydride copolymer interacts with said organic acids by rendering said copolymer in said pigment-based black ink insoluble by transforming said copolymer into a water-insoluble protonated form,

and wherein said organic acids are selected from the group consisting of: polyacrylic, acetic, glycolic, malonic, malic, maleic, ascorbic, succinic, glutaric, fumaric, citric, tartaric, lactic, sulfonic, ortho-phosphoric acids and mixtures thereof.

25. (Currently Amended) The method of Claim 24 wherein said self-dispersed black pigment has a concentration in said pigment-based black ink of ranging from about 0.001 to 10 wt%.

26. (Canceled)

27. (Currently Amended) The method of Claim 24 wherein said cosolvent has a concentration in said pigment-based black ink of ranging from about 0.01 to 50 wt%.

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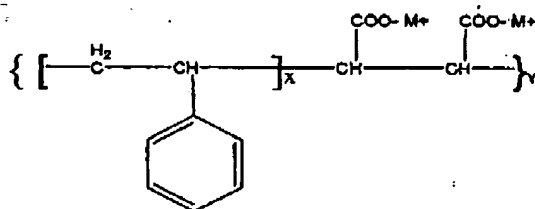
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28. (Currently Amended) The method of Claim 24 wherein said at least one surfactant/amphiphile has a concentration in said pigment-based black ink of up to 40 wt%.

29. (Currently Amended) The method of Claim 28 wherein said at least one surfactant/amphiphile has a concentration of ranging from about 0.1 to 5 wt%.

30. (Currently Amended) The method of Claim 24 wherein said water comprises the balance of said pigment-based black ink.

31. (Currently Amended) The method of Claim 24 wherein said hydrolyzed styrene-maleic anhydride copolymer has the general formula:



(I)

where counter-ion  $\text{M}^+$  is selected from the group consisting of sodium, potassium, ammonium, trimethylammonium, and lithium.

32. (Currently Amended) The method of Claim 31 wherein said copolymer has a molar ratio of styrene to maleic anhydride repeat units within a range of [[from]] 0.2 to 5.

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33. (Currently Amended) The method of Claim 32 wherein said molar ratio is within a range of ~~[[from]]~~ 0.5 to 2.

34. (Original) The method of Claim 31 wherein said copolymer has a molecular weight within a range of about 500 to 50,000 (molecular weight average).

35. (Original) The method Claim 34 wherein said molecular weight is within a range of about 1,000 to 10,000.

36. (Currently Amended) The method of Claim 34 wherein said hydrolyzed styrene-maleic anhydride copolymer has a concentration in said pigment-based black ink of about 0.1 to 10 wt%.

37. (Currently Amended) The method of Claim 36 wherein said hydrolyzed styrene-maleic anhydride copolymer has a concentration of about 0.1 to 3 wt%.

38. (Previously Presented) The method of Claim 24 wherein said multivalent salts include at least one multivalent cation.

39. (Currently Amended) The method of Claim 38 wherein said at least one ~~multi-valent~~ multivalent cation is selected from the group consisting of alkaline metal earths of Group 2A of the Periodic Table, transition metals of Group 3B of the Periodic Table, cations from Group 3A of the Periodic Table, lanthanides, and mixtures thereof.

40. (Currently Amended) The method of Claim 39 wherein said at least one ~~multi-valent~~ multivalent cation is selected from the group consisting of magnesium, calcium, lanthanum, aluminum, neodymium, and mixtures thereof.

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41. (Currently Amended) The method of Claim 38 wherein said at least one ~~multi-valent~~ multivalent cation is present in an amount ~~of ranging from~~ about 1 to 10 wt% of said color ink.

42. (Currently Amended) The method of Claim 24 wherein said at least one dye-based color ink includes at least one of said organic acids.

43. (Canceled)

44. (Canceled)

45. (Currently Amended) The method of Claim ~~[[24]]~~42 wherein said at least one of said organic acids is present in an amount ~~of ranging from~~ about 0.25 to 20 wt% of said at least one dye-based color ink.

46. (Currently Amended) The method of Claim 45 wherein said at least one of said organic acids is present in an amount ~~of ranging from~~ about 1 to 5 wt% of said at least one dye-based color ink.

47. (New) An inkjet ink set, comprising:

a pigment-based black ink consisting essentially of at least one self-dispersed black pigment, at least one cosolvent, water, optionally at least one water-soluble surfactant/amphiphile, and a hydrolyzed form of styrene-maleic anhydride copolymer; and

at least one dye-based color ink consisting essentially of a water-soluble dye, a component selected from the group consisting of multivalent salts and organic acids, at least one cosolvent, and water;

wherein the hydrolyzed styrene-maleic anhydride copolymer interacts with the multivalent salts which are incompatible therewith, or wherein the hydrolyzed styrene-maleic anhydride copolymer interacts with the organic acids rendering



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the hydrolyzed styrene-maleic anhydride copolymer in the pigment-based black ink insoluble by transforming the hydrolyzed styrene-maleic anhydride copolymer into a water-insoluble protonated form, thereby improving black-to-color bleed;

and wherein the organic acids are selected from polyacrylic, acetic, glycolic, malonic, malic, maleic, ascorbic, succinic, glutaric, fumaric, citric, tartaric, lactic, sulfonic, ortho-phosphoric acids, and mixtures thereof.